Vehicle Glazing Panel Cut Out

BACKGROUND OF THE INVENTION

The present invention relates to a vehicle glazing panel cut out technique.

STATE OF THE ART

Vehicle glazing panels such as vehicle windscreens (windshields) are typically bonded in supporting frames by adhesive bonding material such as polyurethane, applied in a continuous bead about the periphery of the glazing panel and frame.

Wire cutting techniques have been previously proposed and used to effect glazing panel removal (for replacement or otherwise). Exemplary techniques are disclosed in, for example, EP-A-0093283, Canadian Patent Specification 2034221, US Patent 6616800, German Patent 4012207 and PCT Publications WO86/07017 and WO98/58779.

An improved technique and apparatus has now been devised.

SUMMARY OF THE INVENTION

According to a first aspect, the present invention provides a winder unit for use with a cutting wire in cutting out a vehicle glazing panel, the unit having:

mounting means for mounting the unit;

first and second winder spools for winding cutting wire; and,

at least one wire wrap around guide element spaced from the winder spools and/or the mounting means.

The wrap around guide element is preferably positioned to the side of a respective proximal winder spool.

The wrap around guide element preferably comprises a guide wheel or pulley rotatably mounted with respect to the unit. Preferably, the winder spools are arranged in side by side arrangement an a respective guide wheel or pulley is positioned outwardly of each respective winder spools. he guide wheel is preferably rotatably mounted relative to the unit. The guide wheels or pulleys are all preferably in the same plane, defined by the position of the wire. It is preferred that at least one of the winder spools includes a ratchet arrangement enabling in one or other direction to be inhibited. Beneficially, the ratchet is releasable to permit rotation in the inhibited direction. The mounting means desirably comprises on or more suction mounts. In one embodiment the unit may include four guide wheels or pulleys, to guide the wire, the guide wheels or pulleys being provided substantially at notional corners of a polygon.

The unit may be used with a wire to remove a glazing panel. Typically ends of the wire cross over and are connected to respective ones of the winding spools.

In certain techniques and embodiments the winder unit may beneficially be used in combination with a guide arrangement.

According to a further aspect, the invention provides a method of cut out of a vehicle glazing panel bonded in a frame by means of interposed bonding material, the method comprising:

setting a wire winder unit on the windscreen, the winder unit including a plurality of winder spools and at least one wire wrap around guide element positioned proximate a corner of the glazing panel;

setting a wire guide arrangement on the windscreen spaced from the wire winder unit, the wire guide arrangement including respective wire wrap around guide elements positioned proximate respective corners of the glazing panel;

looping a cutting wire about the periphery of the glazing panel and inserting first and second ends of the wire through the bonding material;

winding the wire from opposed ends by means of the winder spools.

It is preferred that the set position of the wire winder unit and the wire guide arrangement relative to the glazing panel remains substantially fixed throughout the cut out procedure. There is therefore no requirement to necessarily reposition the apparatus during the procedure.

Beneficially, the winder spools are spaced and the opposed end portions of the cutting wire are wound around respective spools, such that a wire crossover portion is created adjacent the winder spools.

The wire winder unit and wire guide arrangement are preferably set on the glazing panel internally of the vehicle, the cutting wire desirably being looped around

the periphery of the glazing panel externally of the vehicle.

It is preferred that the one or more wrap around guide elements comprise rotatably mounted guide wheels.

In a preferred embodiment, the wire guide arrangement includes a mounting arrangement comprising one or more suction mounts.

In a preferred embodiment, the wire winder unit includes a mounting arrangement comprising one or more suction mounts.

Beneficially, in set up, the cutting wire is inserted to pass through the bonding material at a position proximate a corner of the glazing panel, more preferably at a position to the same side of the glazing panel as the wire winder unit, more preferably still, at a position substantially directly below the wire winder unit.

It is preferred that the wire wrap around guide elements of the guide arrangement are positioned to the same side of the glazing panel.

In a preferred technique, at set up, a longer length of cutting wire extends around the wrap around guide elements of the guide arrangement and is wound on a first winding spool of the winder unit, a shorter length of cutting wire extending around a wrap around guide element of the winder unit and being wound on a second winder spool of the winder unit. The wire beneficially defines a cross over point proximate the winder spools. It is preferred that, the spool connected to the shorter length of wire is first wound in to effect a first cut phase;

the spool connected to the longer wire length being subsequently wound in.

Beneficially, during the procedure a ratchet of one of the spools is released facilitating slackening or more preferably unwinding (reverse winding) of a previously wound portion of the cutting wire.

The guide arrangement preferably includes a mount and a pair of positioning limbs extending from the mount at an apex defined by the proximal ends of the limbs, each said limb carrying at its distal end a respective wrap around guide element for the cutting wire. Desirably, the wrap around guide elements comprise guide wheels rotatably mounted to the respective limbs. Beneficially, the limbs are pivotally connected to the mount such that the angle between the limbs can be varied. The limbs are preferably pivotally connected to the mount such that the limbs can pivot in two mutually perpendicular axes. In a preferred embodiment, the pivotal mount comprises a ball and socket type connection. It is preferred that the apex mount comprises a suction mount.

It is preferred that one or both (preferably both) limbs is provided with a further mount intermediate the opposed ends of the limb. Desirably, the further mount comprises a suction mount. The further mount is preferably adjustable to be secured at various positions along the length of the limb. Alternatively or additionally, the further mount is adjustable with respect to its angular orientation about the longitudinal axis of the limb. It is preferred that the further mount is adjustable to the position of the mount below the limb.

The winder unit preferably comprises:

mounting means for mounting the unit;

first and second winder spools for winding cutting wire; and,

at least one wire wrap around guide element positioned away from the mounting means.

Beneficially, the wrap around guide element comprises a guide wheel rotatably mounted with respect to the unit. Desirably, the mounting means comprises on or more (preferably a pair of) suction mounts.

According to a further aspect, the present invention provides apparatus for use in cutting out a vehicle glazing panel using cutting wire, the apparatus comprising:

a winder unit comprising:

mounting means for mounting the winder unit;

first and second winder spools for winding the cutting wire; and,

at least one wire wrap around guide element positioned away from the mounting means; and,

a guide arrangement including mounting means for mounting the guide arrangement and a pair of positioning limbs extending from the mount at an apex defined by the proximal ends of the limbs, each said limb carrying at its distal end a

respective wrap around guide element for the cutting wire.

Preferred features of the apparatus are as described and exemplified herein.

The invention will now be further described in a specific embodiment by way of example only and with reference to the accompanying drawings, in which;

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic plan view of a winder unit of an exemplary cut out system in accordance with the invention;

Figure 2 is a schematic representation of a guide arrangement for use with a winder unit in accordance with an exemplary cut out system of the invention;

Figures 3a and 3b are detailed views of a parts of the guide arrangement of figure 2;

Figures 4 to 8 are schematic representations in sequence of a cut out technique in accordance with the invention;

Figures 9 to 11 are schematic representations in sequence of an alternative technique in accordance with the invention;

Figure 12 is a schematic representation of a further technique in accordance with the invention; and

Figures 13 and 14 are schematic representations of a further alternative technique in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, and initially to figures 1 to 3, there is shown a cut out system particularly for use in cut out of bonded vehicle glazing panels such as windscreens. The cut out system comprises a winder unit 1 and a guide arrangement 2. A flexible cutting wire is looped around the outside of a windscreen glazing panel to lie peripherally adjacent the bonding bead (typically a polyurethane bonding bead) which is sandwiched between the glazing panel and the support frame of the vehicle. Opposed ends of the cutting wire are fed through a pierced channel made through the bonding bead as will be described in detail and the free ends are then each wound around a separate winder spool 4, 5 of the winder unit. As will be described the long end of the wire is passed around the guide pulley wheels 6, 7 of the guide arrangement 2 and a first one 8 of the guide pulleys of the winder unit 1; the shorter end of the cutting wire being passed around the other of the guide pulleys 9 of the winder unit.

The winder unit 1 comprises a pair of releasable suction cup mounts 10, 11 enabling the winder unit to be releasably secured to the windscreen. The suction cup mounts comprise a rigid plastics cup 12 and underlaying flexible rubber skirt membrane 13. Respective actuation/release levers 14 enable consistent suction to be applied and released. Such suction mounts are commonly employed in windscreen replacement and repair

technology. The suction cup mounts 10, 11 are pivotably/tiltably mounted to the support bracket 15 of the winder unit to ensure that both mounts 10, 11 can locate in good engagement with the windscreen despite the curvature of the windscreen. The main body of the support bracket 15 carries a pair of underslung winding spools 4, 5 in side by side relationship. The spools are connected to axial winding shafts which are supported in bearings 16, 17 provided on the winder unit. The spools 4, 5 are driven axially rotationally either manually via a hand winder or by means of a mechanical actuator such as a motorised winding or winching tool. Drive bosses 18 are provided with female sockets 19 (square bores) for receiving the male driving tool. Positioned outwardly of the winding spools are respective wire guide pulley wheels 8, 9 of low friction plastics material. The pulley wheels are mounted to be rotatable about respective rotational axes. The guide pulleys rotate as the cutting wire is drawn tangentially across the pulleys as will be described. The winder spools 4, 5 are held to rotate in one direction only (each in opposite senses) by respective ratchet mechanisms. Each mechanism includes ratchet override permitting prior tightened wire to be slackened, or unwound (reverse wound).

The guide arrangement 2 comprises an apex suction cup mount 20 from which extends angularly spaced arms 21, 22 each of which carry at their respective distal ends a respective distal guide pulley wheel 6, 7. The distal guide pulley wheels 6, 7 are manufactured of low friction plastics material and mounted rotatably to the distal ends of the arms on respective support bosses 23, 24. each pulley wheel includes a peripheral channel 25 within which the cutting wire locates. Each arm 21, 22 is

provided with a respective distal suction cup mount 26, 27. The distal suction cup mounts 26, 27 are slidable along the respective arms 21, 22 and provided with securing clamps 28 actuated by a turn handle 29 to secure the respective distal suction cup mount at the desired position along the length of the respective arm. The securing clamps also permit angular rotation of the distal suction cups about the circumferential outer surface of the rod (arrow A in Figures 2 and 3a) comprising the respective arm. The depth of the suction cup mounts below the respective arms is also adjustable (arrow B in Figures 2 and 3a) by means of the suction cup mount including an upstanding post 31 about which the clamp 28 relatively slides and secures by means of a grub screw 30. The suction cup mount 26, 27 can also pivot about the upstanding support post 31 (arrow C in Figure 3a). The proximal ends of the arms are mounted to the apex suction mount 20 by means of respective spherical surface profile bosses 35 about which part spherical annular bushed bearings 37 are mounted. These mountings permit the angle between the arms to be adjusted (arrow D in Figure 2) to suit the configuration and size of the subject windscreen. Also the angle between the arm axis and the surface of the windscreen can be varied to suit the curvature of the windscreen (arrow E in Figure 3b). The arrangement of the guide system as described ensures that the distal guide pulley wheels 6, 7 can be accurately positioned in close proximity to the corners of the windscreen, and that the distal suction cup mounts 28 can be conveniently located to provide secure support proximate the distal pulley wheels 6, 7. Because the arms 21, 22 are both mounted to the apex suction cup mount 20 the whole guide arrangement is securely held to the windscreen the arms taking up the considerable

bracing forces exerted by the cutting wire in tension. In view of the large forces generated in the wire during winding, it is important that the guide arrangement is sufficiently securely held secured to the windscreen and of sufficient structural integrity.

Referring to figures 4 to 8 in which operation of the system to cut out an exemplary body such as a vehicle windscreen is described. The present technique enables the positioning of the system apparatus to achieve cut out with little or no subsequent re-positioning of the system apparatus. The set up is therefore an important phase of the technique.

The guide arrangement 2 is initially attached via the suction cup mounts 20, 28 to the inside of the windscreen as shown in figure 4. The aim is to position the pulley wheels 6, 7 as far into the upper and lower corners of one side of the windscreen as possible, with as little separation between the glass and the pulley wheel as possible. Usually the guide arrangement pulley wheels 6, 7 are positioned to the non-driver side of the vehicle. In the right hand drive embodiment shown the guide arrangement pulley wheels 6, 7 are positioned in the upper and lower left hand corners of the windscreen. The suction pads are positioned with this consideration and the adjustable clamps used to fine tune the positioning.

The winder unit 1 is secured to the underside of the windscreen to the opposite side of the windscreen, along the top edge with the pulleys in side by side relationship such that one of the pulley wheels (pulley wheel 9) is positioned as far into the top corner as possible. This arrangement is shown in figure 5.

The cutting wire preferred for use is generally square in cross section as is known for use in other modalities of windscreen removal. With the winder unit and guide arrangement in position as described, the cutting wire is looped around the outside of the windscreen to lie peripherally adjacent the bonding bead which is sandwiched between the glazing panel and the support frame of the vehicle. Opposed ends of the cutting wire are fed through a pierced channel made through the bonding bead in the corner of the windscreen (x) below the position of the winder unit 1. A longer end length 40 of the wire is pulled through to the interior of the vehicle and passed around the two pulley wheels 6, 7 of the guide arrangement and connected for winding to the winder spool 4 of the winder unit closest to the corner in which the winder unit is mounted. The shorter end length 41 of the wire is fed adjacent the inside of the windscreen and passed around the pulley wheel 9 of the winder unit closest to the corner in which the winder unit is mounted before being connected for winding to the other winder spool 5 (the ends of the wire therefore cross in order to connect to the respective winder spools 4, 5 of the winder unit. The situation as described is shown in figure 6. This concludes the set up phase of the technique.

The first phase in the cutting procedure is to wind the wire shorter end length 41 by winding in on the left hand winding spool 5; this causes the cut line to move upwardly through the bonding bead and around the upper corner of the windscreen proximate to the winder unit, passing along a short portion of the upper edge of the windscreen. The shorter end length takes up sequential

positions as shown by the dashed line in figure 7. At this point the ratchet is released and the spool is rewound a little until the wire becomes slightly slack. The reason for this is described later in the procedure.

Operation of the other winder spool 4 of the winder unit 1 effects a cut along the bottom edge of the windscreen up the side of the windscreen proximate the guide arrangement and along the top edge of the windscreen. The sequential interior wire length positions are shown in dashed line in figure 8. Initially, after the wire has come clear of the lower guide pulley wheel, the ratchet previously released from the first operated winder spool is reactivated. Continued operation of the second winder spool 4 moves the cut line around the top corner of the windscreen and along the upper edge of the windscreen (from left to right as shown in the drawings) crossing over the shorter wire length portion above the winder unit to effect complete cut out of the windscreen.

As described above the ratchet of the first used winder spool 5 is released following the first, short length cut. This is because in the second cut stage in which the longer length wire is wound in and in which the cut line moves from right to left along the lower edge of the windscreen in the drawings, the thicker excess bonding material that is likely to be encountered in this region of the windscreen will be tough to cut through, increasing the forces transmitted through the system. By deactivating the ratchet of the first winder spool 5, the wire will slip/slide at this point, feeding back off the first spool to an extent resulting in a cutting slicing action that aids the cut effectiveness at this point. When the tougher cut has been accomplished, the wire will

again follow the path of least resistance and resume cutting normally (and the wire will stop back feeding off the first winder spool). This system tweak reduces the likelihood of the wire breaking due to excessive tension. The ratchet can then be reapplied. The point at which the ratchet should be reapplied and deactivated typically comes down to operator skill, experience and judgement.

In the technique shown in figures 9 and 10, the glazing panel is removed using a wire 41 and the winder unit 1 only (no additional guide, such as guide 2 is required). In this technique the winder unit is initially secured to the steering wheel side of the glazing panel, positioned above the steering wheel as shown in figure 9. With the winder unit and guide arrangement in position as described, the cutting wire is looped around the outside of the windscreen to lie peripherally adjacent the bonding bead which is sandwiched between the glazing panel and the support frame of the vehicle. Opposed ends of the cutting wire are fed through a pierced channel made through the bonding bead in the corner of the windscreen (x) below the position of the winder unit 1.

A length 41 of the wire is pulled through to the interior of the vehicle and passed around pulley wheel 9 of the winder unit and connected for winding to the winder spool 5 of the winder unit. A free end length of wire 47 is pulled through, being of length sufficient to reach the upper left hand corner of the glazing panel. Winder spool 5 is then operated to cause the wire length 41 to cut through the bonding bead upwardly along the side of the windscreen, until th cut line has passed around the upper right hand corner of the screen. At this juncture, the unit 1 is removed from the screen and repositioned on

the glazing panel in the upper left hand corner as shown in figure 10. Prior to repositioning the unit 1, the ratchet of winder spool 5 is released to permit the wire to be wound out from the spool as it is moved across the glazing panel to be repositioned. The ratchet is subsequently re-engaged and spool 5 once again operated to wind in the wire from the position shown in figure 10 until it reaches the position shown in the dashed line in figure 10.

Next the unit 1 is moved around the corner of the glazing panel and through substantially a right angle, to the position shown in figure 11, where it is secured to the glazing panel. In order to enable this the ratchet of spool 5 is again released and subsequently re-engaged when the unit is in position as shown in figure 11. The end of the free length of wire 47 is then wound around pulley 8 and connected to winder spool 4 and the spools 4 and 5 operated either sequentially (or simultaneously)to complete the cut. As shown in figure 11. The lengths of wire cross at Z in order to complete the cut. The presence of the pulleys 8, 9 spaced outwardly from the respective spools 4,5 aids in operation of the winder unit during the cutting process.

In figure 12 there is shown a modified winder unit 1 having additional wrap around pulleys 108, 109, positioned to provide a respective pulley at four respective corners. The unit is mounted as shown in figure 12 approximately central to the glazing panel. The wire is looped around the exterior of the panel with two ends of the wire passing through a channel at X into the interior of the vehicle. The free ends are secured to respective spools 4,5 with a wire crossover at 115.

Operation of the spools 4,5 to wind in respective lengths of wire from the position shown results in cut through being effected about the entire periphery of the glazing panel.

In a modification to this technique the four pulley winder unit is used as shown in figures 13 and 14. The unit is initially positioned as shown in figure 13, and pulley wheel 4 initially operated to wind the wire around the upper left hand corner of the glazing panel. Subsequently the unit is repositioned to the position shown in figure 14 and both winder spools 4 and 5 operated (typically in sequence) to complete the cut through process.

The present invention provides the benefits of wire cutting systems without over complex system apparatus arrangements or the need to re configure the apparatus significantly following initial set up. The technique can be used by operators of relatively little experience or physical strength following an initial set up routine of minimal complexity.